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Canadian Cooperative Wildlife Health Center Newsletter, Volume 5-1, Winter 1997

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In this issue:

Since early spring, we have had two volunteers in our Saskatoon office, helping primarily with regional centre activities and also to a limited degree with headquarters functions. These people were attracted through notices placed by us in local newsletters (Nature Saskatchewan, Environmental Society, Forestry Farm Park). The volunteers are managed by Jacqui Brown (CCWHC Office Manager), who "collects" appropriate tasks for them; they call in on a regular basis and come in when needed to help with such tasks as data entry (diagnostic reports from other laboratories), filling orders for publications, and literature searches. Both value the ability to help, and we value the time gained to work on other matters. Thanks to Noreen Grenkow and Karen Comer for this wonderful help.

New voice in CCWHC - Ontario Region

Contacts in Ontario Region will have noticed a new voice on the phone and a new name on reports over the past few months. Our Staff Pathologist, Doug Campbell, has been on leave-of-absence for the fall, and his place has been taken by Dr. Caroline Brojer.

Though of Swedish background, Caroline grew up in Mexico and went to university in the United States, so she is fluent in Spanish and English, as well as Swedish. She gained her DVM at the Swedish Veterinary College in Uppsala, and subsequently spent several years in mixed veterinary practice.

More recently, she was an Assistant Veterinary Officer in the Department of Wildlife of the Swedish National Veterinary Institute (SVA), Uppsala, one of three specialists in wildlife diseases. Duties included carrying out autopsies on wildlife submitted to the SVA by biologists, hunters, farmers and members of the public, and providing information on wildlife health issues to veterinarians and members of the public. A puzzling problem of chronic diarrhea seen in roe deer, the most common deer in Sweden, was of particular interest. She also did referral meat inspection on game meat, and meat from farmed deer.

Dr. Brojer is working on an MSc with Dr. Bruce Hunter in the Department of Pathobiology at the Ontario Veterinary College, on a disease of the feet of ranched mink fed seal meat. Her husband, Johan, is also carrying out graduate work at OVC.

BOTULISM ON THE PRAIRIES: another bad year, with new wrinkles.

Return of good water conditions on the prairies, after the drought of the 1980's and early 90's, has been beneficial for prairie-nesting waterfowl. However, filling of some large terminal lake basins, that were dry at the start of this decade, has developed into a major management headache because of avian botulism. Botulism is not a new problem on these lakes. A die-off, likely due to botulism, was recognized at Whitewater Lake, Manitoba in 1912; disease outbreaks occurred there most years between 1944 and 1953 1, and botulism was confirmed for the first time during a die-off in 1953 2. An outbreak that may have been botulism was reported in 1928 on Pakowki Lake, Alberta and botulism was confirmed during an outbreak in 1980 in which an estimated 24,900 birds died 3. An estimated 10,000 and 100,000 birds died at Old Wives Lake, Saskatchewan in 1959 and 1969, respectively 4. (These estimates must be considered as little more than guesses, because none was based on systematic sampling). The situation on these lakes over the past few years has been described in previous newsletters and is summarized below:

Number of bird carcasses collected (or estimated) during outbreaks of avian botulism on three prairie lakes from 1994 to 1996.

Lake	**1994**	**1995**	**1996**
Pakowki Lake, Alberta	31,517	>100,000	12,000
Whitewater Lake, Manitoba, ND*	(3,400)	117,000	
Old Wives Lake, Saskatchewan	16,000	ND	(136,000)

*ND - no data available.

The 1997 Situation

The area of Whitewater Lake in 1997 was 75 Km2. Surveillance was begun in early spring. During the first survey on 13 May , "old" carcasses of dabbling ducks from the previous autumn were observed, as well as recently dead Lesser Scaup and American Coots. Botulism was confirmed in the scaup and coots. Botulism in diving birds shortly after thaw fits the pattern of "spring botulism" that occurs on some wetlands which suffered a die-off the previous summer. The birds are poisoned by consuming invertebrates associated with carcasses from the previous year (see Vol. 4-3 for further information). Mortality did not stop at Whitewater Lake, as has occurred in other spring outbreaks. Dead birds were found throughout the early summer and by 18 July, 4360 carcasses had been collected. Among specimens submitted to the laboratory were four Northern Pintail ducklings found dead on 2 July, each of which had consumed a large number of maggots (Fig. 1). One duckling had 128 intact and many partially digested maggots in its upper digestive system. One gram of the maggots contained sufficient botulinum toxin to kill >10,000 mice. Although ingestion of toxin-bearing maggots is the major way that ducks become poisoned, it is unusual to find maggot remains in dead birds, because the maggots are digested rapidly. The number of maggots consumed by these ducklings indicates that this source of toxin was readily available in early summer. Loss of ducklings during outbreaks is difficult to detect, because the small carcasses are hard to find and disappear rapidly. Despite this, the number of duckling carcasses found at Whitewater Lake in 1996 was equivalent to 29% of the ducklings produced on the lake. If multiplied by a very conservative factor of 2, to correct for carcasses not found, more than half of the ducklings produced died of botulism in that year4 . Management changed from surveillance to cleanup on 23 July. Despite the use of up to five airboats for carcass collection, the die-off continued and expanded. By 11 September, when carcass searches stopped, 48,961 carcasses had been collected.

The area of Pakowki Lake in 1997 was 117 Km2. Systematic surveillance, as has been done since 1995, was begun on 5 May, but no dead birds were detected until 16 July. Despite intensive carcass collection, the outbreak expanded over the summer and 45,052 dead birds were collected. 87% of the birds collected were ducks, with Green-winged Teal and Northern Pintails comprising 35% and 20% of the total, respectively.

The area of Old Wives Lake in 1997 was 350 Km2. Birds with botulism were detected on 4 June by Trent Bollinger, CCWHC Western/Northern Regional Centre. The Canadian Wildlife Service, Ducks Unlimited Canada, California Waterfowl Association and Sask. Environment and Resource Management supported a research and monitoring program that began in July, with Trent Bollinger as coordinator. The program included systematic surveillance to measure the extent of mortality and the species involved, monitoring of bird use on the lake, collection of water chemistry and weather information, and attempts to measure the effectiveness of carcass collection. This is believed to be the first time that mortality has ever been measured in a major botulism outbreak using a statistical sampling method. Eight 1 Km2 study plots were established; four in a 10 Km2 area of heavy vegetation, and four along the shoreline. Within each block, five 4 X 1000m transect lines were searched each week. Sick and dead birds on the transects were classified by species, sex, age, stage of moult, and degree of decomposition. Extrapolating from the number of sick and freshly dead birds found on the transects, approximately 500,000 birds died on the lake over the summer. Of these, 85% were ducks and coots, with Northern Pintails accounting for 23% of the mortality.

Two trials were conducted to measure the proportion of carcasses found during a carcass cleanup. A known number of carcasses were marked in an area immediately prior to cleanup. A three man crew using an airboat spent 13 hr removing carcasses on a 0.25 Km2 area of dense emergent vegetation; >3000 carcasses were found but only 61% of marked carcasses were recovered. Ten days later, new carcasses were marked and the same area was searched again. Fewer dead birds were found, so the search was more rapid, but only 33% of marked carcasses were recovered. This rate of carcass recovery is similar to that on another marsh in which 32% of marked carcasses were found 5. The magnitude of attempting a complete carcass collection on Old Wives Lake becomes apparent if one extrapolates from these trials. Approximately 65 airboat-days (or 22 airboat crews working 8 hr/day for 3 days) would be required to cover the 10 Km2 of heavy vegetation once, with the same intensity that resulted in collection of 61% of marked carcasses. This estimate does not include any carcass collection on the other 97% of the lake where carcasses were present but less numerous.

Botulism occurred in cattle pastured on the shore of Old Wives Lake. On 30 July, two cows were found unable to rise near the shore. During the next month, seven additional cattle became paralysed. Of these, three died, four were euthanized, and two recovered after 22 and 34 days of recumbency. Sera from five cows were tested by mouse inoculation; all were positive for type C botulinum toxin. Type C botulism has occurred in cattle in other parts of the world. Cattle suffering from phosphorus deficiency in Africa, Australia and South America develop botulism after chewing bones or old carcasses. It has also occurred when poultry litter, containing bird carcasses, has been added to cattle feed. This is believed to be the first situation in which disease in cattle has been associated with mortality in waterfowl. The source of toxin is unknown but large numbers of maggots, presumably filled with toxin, were observed by the local veterinarian in the water at the site where the cattle drank.

It appears that the outbreak at Whitewater, and perhaps that at Old Wives Lake, was a continuation of the previous year's die-off, probably beginning with poisoning of birds early in the spring by toxic material that remained overwinter. Spring botulism had not been recognized previously on either lake. There was no evidence of spring botulism at Pakowki Lake. Despite very intensive efforts to collect carcasses on Whitewater and Pakowki Lakes, mortality was extensive. There is no way of estimating what would have happened on these lakes without carcass pickup.

A major factor that has not been measured on these lakes is the population of birds at risk, hence, the relationship between the number, species, density and distribution of birds and mortality is unknown.

The Northern Pintail is of special concern, because this species has not responded as well as other dabbling ducks to improved habitat conditions. Old Wives and Pakowki Lakes are in the prime nesting area for Pintails, and they comprised 20% of the mortality on these lakes. Pintails comprised a smaller proportion of the mortality at Whitewater Lake but losses there also were substantial. Repeated mortality of thousands of Pintails, particularly of adults, on these lakes could negate duckling production over vast areas.

(Information for this synopsis was provided by many people, special thanks to D. Clayton and B. Calverley, Ducks Unlimited Canada and M. Pybus, Alberta Fish and Wildlife).

1. Pratt, A. 1996. 1996 Whitewater Botulism Data Summary Report. Ducks Unlimited Canada. 53 pp.

2. Bossenmaier, E.F., et al., 1954. Trans. N. Amer. Wildl. Conf. 19:163-175.

3. Pybus, M. 1995. A History of Botulism Poisoning in Waterfowl in Alberta. Alberta Fish &Wildlife Report. 9 pp.

4. Neraasen,T. 1997. Ducks Unlimited Canada Perspective on Botulism Management and Research. Presented January 27, 1997, Saskatoon, Saskatchewan. 10pp.

5. Cliplef, D.J., and G. Wobeser 1993. J. Wildl. Dis. 29:8-12.

Necropsy of a Right Whale on Long Island, Nova Scotia

The North Atlantic right whale (Eubalaena glacialis) is the most endangered large whale in the world. Several factors seem to prevent its recovery, despite > 60 years of protection. Among these are inbreeding depression as a result of its small population size (Schaeff et al., 1997. Can. J. Zool. 75:1073-1080) and human-related accidents such as entanglements in fishing gear and collisions with ships. Kraus (1990, Mar. Mamm. Sci. 6:278-291) estimated that one third of all right whale mortality in the North Atlantic is caused by human activities. Any information gained from the rare opportunity to necropsy individual animals is highly valued. Unfortunately, severe postmortem decomposition plagues the examination of most such animals. On 19 August, a tuna fishing boat reported a dead right whale floating in the Bay of Fundy, about 1.6 nautical miles east of the shipping lanes leading to Saint John, New Brunswick. After a reseach vessel from the New England Aquarium (NEAq), in Boston, had confirmed the species, it was towed to Long Island, N.S., where it was necropsied the following day. Several agencies were involved, including East Coast Ecosystems (Freeport, N.S.), NEAq, Woods Hole Oceanographic Institute, the University of North Carolina, and the CCWHC's Atlantic Regional Centre. Much of the cost associated with towing the whale and disposing of the carcass was covered by the NEAq.

The animal was a female, probably near maturity. Its rostral callosities matched those of a whale first sighted in 1994. The thickness of its blubber suggested that it was in reasonably good body condition. A significant lesion in this animal was fracture of the right mandible. There was little hemorrhage associated with this fracture, although blood could have been washed off by sea water after death. The relatively smooth appearance of the broken surfaces suggested that the fracture had been sustained some time (at least days) before death. The contribution of this mandibular fracture to the animal's death is unclear. Such a fracture likely would prevent feeding in blue whales and fin whales, which rely on tremendous expansion of the grooved ventral pouch of their oral cavity for engulfing and subsequently sieving plankton through their relatively short baleen plates. A mandibular fracture may not necessarily have fatal consequences in the right whale and bowhead whale, which feed by slow skimming at the surface, and rely primarily on their long baleen for collecting plankton. Philo et al.(1990, J.Wildl. Dis. 26: 125-128) described a chronic fracture of the right mandible with nonunion in a subsistence-harvested female bowhead whale in good body condition. A more contentious change in this animal was the presence of a large amount of gelatinous red-tinged fluid underneath the blubber over much of the animal's back. At the time of necropsy, this was interpreted as being compatible with a blunt trauma, e.g., from collision with a ship. However, it may have been a postmortem change. Several internal organs could not be examined properly because of severe postmortem decomposition.

The cause of death of this right whale remains uncertain. The mandibular fracture was a significant finding highly compatible with collision with a ship and may have been related directly or indirectly to the animal's death. Unfortunately, further details were lost because of the poor state of preservation of the carcass. (Pierre-Yves Daoust and Scott McBurney, CCWHC - Atlantic Region).

Morbillivirus infection in four lynx

Several lynx (Lynx canadensis) from Cape Breton, Nova Scotia were submitted to our laboratory over the last year. For a few days in November 1996, an immature male lynx was observed hiding beneath vehicles in the community of Long Point. This aberrant behaviour eventually resulted in the animal's death by a fatal vehicle accident. At necropsy, it was in very poor body condition. There was an inflammatory reaction in the meninges and brain sufficient to account for the behavioural abnormalities and the animal's debilitated condition. In December 1996, a second immature male lynx was shot when it acted aggressively towards a deer hunter, and other methods of scaring it away failed. Again, microscopic examination of the brain revealed a significant inflammatory reaction in the brain and meninges. A third lynx, also an immature male, was found by snowmobilers on the highlands in late February 1997. This animal had absolutely no fear of humans, readily submitting to capture and handling. It was maintained in a private home for a few days, then was sent to Shubenacadie Wildlife Park in Truro, NS, for rehabilitation. However, fine muscular tremors and an apparent lack of awareness persisted, and the lynx was euthanized. Microscopically, there was a severe inflammatory reaction in the brain, meninges and spinal cord. Extensive demyelination was present in the brainstem and spinal cord. Laboratory examination of the brain for rabies virus was negative. A fourth lynx, a mature female, was observed staggering and disoriented on a woods road in late July 1997. The animal could easily be approached and touched, so it was hand-captured by wildlife officials, taken to a local veterinarian and euthanized. Gross examination revealed an extremely emaciated animal, and microscopic lesions in the brain and spinal cord were similar to those identified in the third lynx. Laboratory examination of the brain for rabies virus was negative. Seven uterine scars were present in this animal's uterus. It is doubtful that the young would have survived without their mother.

Further diagnostic work (i.e., immunohistochemistry and serology), has confirmed a morbillivirus as the cause of the neurological disease in these animals. A morbillivirus infection was previously diagnosed at our laboratory in two bobcats (Lynx rufus) from New Brunswick (see CCWHC Newsletter 3(1). Canine distemper is a well known disease of canids, mustelids and raccoons that is caused by a morbillivirus. It can reoccur in a cyclical manner, thus acting as a limiting factor to population growth. Distemper morbillivirus infection in cats is a recent event, with epizootics reported in captive exotic felids in North American zoological parks, and in free ranging lions in the Serengeti region of Tanzania. We are currently attempting to isolate the morbillivirus from two of the infected lynx. If this is successful, the virus can be characterized more completely, and this may help in identifying its origin and predicting its biological behaviour. (Scott McBurney - CCWHC, Atlantic Region and Dan Banks/Don Anderson - Nova Scotia Department of Natural Resources)

Ethylene glycol intoxication in a raccoon

A 1 year old raccoon was observed wandering in a farmyard. The animal had abnormal behaviour, showing no fear of humans and aggressiveness when approached. The raccoon was shot and submitted to the laboratory. The macroscopic examination of the carcass was unremarkable. Upon histologic examination, numerous calcium oxalate crystals were seen in the distal and proximal convoluted tubules of the kidney. A few of these crystals were found under the transitional epithelium of the urinary bladder and in the Virchow-Robin space of a few vessels of the brain. These findings are diagnostic for ethylene glycol poisoning.

Ethylene glycol is the common automobile anti-freeze with wide domestic use. It causes many cases of intoxication in domestic animals during the winter. It has a sweet taste that makes it attractive for several animal species. Ethylene glycol is metabolized into oxalate by hepatic enzymes. Oxalates precipitate into the urinary tubules and their presence in large amounts at this location is diagnostic for ethylene glycol toxicosis. Death generally occurs within hours, due to the neurotoxicity of the metabolites of ethylene glycol and to severe metabolic acidosis. Animals that survive a few days die because of kidney failure. The present case shows how important it is to safely dispose of domestic chemical wastes to prevent intoxications in wild and domestic animals. (Igor Mikaelian and Daniel Martineau, CCCSF - Quebec Region).

Risk of morbillivirus to the St. Lawrence Estuary beluga (Delphinapterus leucas)

The St. Lawrence estuary (SLE) beluga population is endangered (see CCWHC Bulletin 4-2). A morbillivirus epizootic in SLE beluga could potentially have a catastrophic effect similar to that recently described in Mediteranean monk seals off the Mauritanian coast(Osterhaus et al., Nature 1997, 388, 838-839). The gregarious behaviour of beluga would favor the transmission of the virus while the restricted range of this population would result in rapid dissemination of the virus to a large proportion of the population. Furthermore, SLE beluga have high tissue concentrations of organochlorine compounds (Martineau et al., Arch. Environ. Contam. Toxicol. 1987, 16,137-147) which are potent immunosuppressive agents in all species in which they have been tested, including marine mammals (Ross et al., Environ. Health Perspect. 1995, 25, 162-167). An association between severity of morbilliviral infection and presence of organochlorinated compounds was described for harbor seals in the North Sea (Hall et al., Sci. Total Environ. 1992, 115, 145-162). Therefore, an epizootic could be more devastating in SLE beluga than it would be in belugas from less contaminated areas (i.e. Arctic).

To date, there is no published report of morbillivirus infection in beluga and populations from the Arctic do not appear to have been exposed to these viruses (Duignan et al., Vet. Microbiol. 1995, 44, 241-249; Measures and Nielsen unpub. data).

We have serologically tested 13 beluga stranded on the shores of the St. Lawrence estuary for the presence of antibodies against dolphin and porpoise morbilliviruses. Antibodies against these two viruses were not found in any of the whales tested. Measures and Nielsen (unpublished data) serologically tested 14 beluga from Nunavik (northern Quebec) and an additional 18 SLE beluga - all were seronegative to dolphin morbillivirus or any related morbilliviruses.

A fatal case of distemper was reported in 1991 in a harp seal (Phoca groenlandica) from the Gulf of the St. Lawrence (Daoust et al., J. Wildl.Dis. 1993, 24, 114-117). This report indicates that at least phocine morbillivirus is present on the Atlantic Coast. However, no other clinical cases of morbillivirus infection in phocids or in cetaceans have been recorded on the east coast of Canada.

The absence of antibodies in SLE beluga suggests that these animals have not been exposed to dolphin and porpoise morbilliviruses, although it is possible, but unlikely, that they are refractory to infection. A limited sample of Atlantic white-sided dolphin, harbour porpoise, minke whale and northern bottle-nosed whale stranded in the SLE also were seronegative to morbilliviruses; however, a grey and a harbour seal from the SLE were seropositive for phocine morbillivirus (Measures and Nielsen, unpublished data). Thus, SLE beluga may be at risk for an outbreak of morbillivirus. The CCWHC and Fisheries and Oceans are preparing an emergency plan in case of such an event. (Igor Mikaelian and Daniel Martineau, CCCSF - Quebec Region; Carole House - National Veterinary Services Laboratories, Greenport, NY, USA; Lena Measures - Fisheries and Oceans.)

Bullfrog mortality in a man-made pond

At the begining of September 25 frogs were found dead in a man-made pond in Brantford, Ontario. The pond had clear water and was approximately 900 m x 75 m and 60 cm deep; it had recently turned over. Fish and muskrats in the pond seemed healthy. Twelve bullfrogs in late metamorphosis and one adult leopard frog were submitted for necropsy to the CCWHC in Guelph. All the frogs submitted had some degree of redness in the hind legs. A complete necropsy was performed on four moribund animals that were euthanized; dead frogs were decomposed. Apart from the red legs, all frogs examined had 2-5 mm white ulcerative skin lesions located on various parts of the extremities and, in one frog, over the face below the eye. The spleen in all the frogs was enlarged. Our differential diagnoses included "red-leg" (bacterial septicemia) and frog erythrocytic virus (iridovirus) infection.

"Red leg" refers to the redness of the extremities seen in many cases of amphibian bacterial infections, usually due to opportunistic infections with Gram-negative environmental bacteria such as Aeromonas and Pseudomonas. Clinical signs include lethargy and no appetite; but sudden death is common. Gross lesions include subcutaneous hemorrhages, especially on the ventral surface of the extremities, skin ulcerations, splenic congestion and enlargement, and liver necrosis.

Iridovirus is an often fatal virus believed to affect tadpoles to a greater extent than adult frogs. It leads to fluid accumulations and subcutaneous hemorrhage, and frogs may become secondarily infected by bacteria. The disease can be diagnosed by demonstration of inclusion bodies in red blood cells by Giemsa staining.

Histopathology of the bullfrogs revealed multifocal liver necosis with many Gram-negative rod-shaped bacteria, and occasional granulomas which did not contain acid-fast staining bacteria. The skin lesions had necrosis of the epidermis with large numbers of bacteria, fungi, fibrin and mixed inflammatory cells. Inflammation extended into the dermis and involved skeletal muscle and tendons of affected limbs. The spleen of three of the frogs contained obvious macrophages with evidence of erythrophagocytosis. No viral inclusion bodies were detected in blood smears. Bacterial culture revealed large numbers of Pseudomonas sp. in the lung, liver and skin. Thus, infection with Pseudomonas was the cause of disease.

Pseudomonas bacteria are ubiquitous in the environment and usually do not cause disease in frogs, unless they are debilitated or stressed. In this case, perhaps the turnover of the pond, or the fluctuating temperatures experienced in early September (the optimal body temperature for bullfrogs in summer is 28 C), predisposed frogs, already stressed by metamorphosis, to infection by opportunistic environmental microorganisms. (Caroline Brojer and Ian Barker, CCWHC - Ontario Region; Cameron Hall - Ontario Ministry of Environment and Energy).

Snow Goose mortality near Fort Severn, Ontario

Several hundred dead lesser snow geese (Anser caerulescens) were sighted from the air by people making flights from Manitoba to Fort Severn, Ontario between the end of August and the first two weeks in September; dead geese were then seen south of the Severn River. Both immature and adult geese were reported to be involved. As well as the dead geese, it was reported that live geese could be run down and caught on foot.

The CCWHC in Guelph received frozen carcasses of two geese through Bernie Wall, Fort William Reserve. Both birds had a large amount of food in the esophagus and stomach, suggesting an acute death. The only gross lesion was congestion and hemorrhage in the lungs. On microscopic evaluation, small, multilocular protozoan cysts resembling Leucocytozoon schizonts were found throughout the liver. There was a focal, chronic inflammation of the heart in one of the birds and focal inflammation of the kidney in both birds. Bacterial cultures of lung, liver, and kidney were negative, as were viral cultures of the same tissues.

Leucocytozoon spp. are common protozoan parasites of waterfowl, in which sexual stages of the parasite are found in blood cells. These organisms are ingested by blood-feeding blackflies, in which part of the life-cycle takes place. Transmission occurs when an infected blackfly feeds on a susceptible bird. Immature stages of the organism pass through several cycles of asexual replication (schizogony) in blood vessels and various other tissues of the body, finally releasing stages that infect red and white blood cells. Disease due to Leucocytozoon is associated with schizogony.

Although infection with Leucocytozoon is common in waterfowl, disease is rare. Typically it occurs in young goslings or ducklings during blackfly season. Involvement of all ages of geese, in the late summer/early fall, is unusual, but no other pathogens could be implicated in the deaths of the limited sample of birds received. (Caroline Brojer and Ian Barker, CCWHC - Ontario Region; Bernie Wall (Nishnawbe-Aski Nation,Treaty Nine.)

Thick-billed Murres

On 16 July, 1997, Canadian Wildlife Service biologists noted a dead thick-billed murre (Uria lomvia) on a breeding colony at Coats Island, NWT. While retrieving the carcass, a second dead bird was found. Both had full brood patches. One still had the egg tucked into its brood-patch while the other had slumped off the egg; both apparently died while incubating and both had one eye closed and apparently "shrunken". Both birds were well below the normal weight for incubating birds at this colony.

On 18 July, at a breeding site about 50 meters from the previous birds, a murre was observed with one eye partially closed and rimmed with exudate. It was behaving very strangely, lolling across the back of its incubating partner, its head flopping loosely in an abnormal manner. From time to time it perked up and behaved normally for a few minutes, and, during some of these interludes, it performed a change-over of incubation with its mate. However, within 1 to 2 minutes it allowed the egg to slip from under its brood-patch, whereupon its mate resumed incubation. The next day the sick bird had one eye partially closed, but was no longer lolling about. However, it showed little interest in incubation and a few moments after change-over with its mate it stood up, allowing the egg to roll aside, and stood at its side, ignoring the egg and sleeping intermittently. This behaviour continued until 24 July, with the sick individual gradually taking greater interest in incubation until its behaviour finally became normal. The shrunken eye gradually improved until, by 1 August, no sign of shrinkage could be detected.

The period during which these observations occurred was especially warm, with maximum shade temperatures of 14-21 C during 11-15 July and 18 C on 18 July (record highs). During this time, many incubating birds showed symptoms of heat stress: gaping, panting, and spreading their wings to allow additional air circulation. Coats Island experiences the highest maximum temperatures of any of the large Canadian thick-billed murre colonies.

The two dead murres were submitted to CCWHC Guelph. On post-mortem examination, there were urate deposits on the kidneys, and small amounts of dried exudate were evident in one eye of each bird . Bacterial culture of liver and lung were negative. Swabs of the eyes with exudate were positive for Mycoplasma anatis. Histologic interpretation was hampered by autolysis and freeze-thaw artefacts. However, there was accumulation of uric acid crystals in the tubules of the kidney which would be consistent with dehydration. The significance of the Mycoplasma isolate is unclear, but related agents are associated with ocular infections in other species of birds. Caroline Brojer, Ian Barker, Anthony Gaston (Canadian Wildlife Service, Hull).

Barbiturate poisoning of bald eagles

Three bald eagles (Haliaeetus leucocephalus) found near the Campbell River, British Columbia, landfill on 26 April, 1997 were poisoned by ingesting the barbiturate, sodium pentobarbital (a euthanizing agent commonly used by veterinarians).

Two of the eagles first were discovered on the ground in a hunched position. When handled they were unresponsive and were profundly sedated. The third bird initially was found perched in a tree with its wings extended. It made an uncoordinated attempt to elude rescuers by flying low, colliding with a tree, and tumbling to the ground. After handling, one of the eagles regurgitated its crop contents, which were grossly identified as a single large piece of liver or spleen. Chemical analysis of this material confirmed the presence of pentobarbital. By 28 April, the three eagles had improved significantly. They were maintained at a local wildlife rehabilitation facility and eventually were released.

In Campbell River, the SPCA regularly collects the carcasses of pets and other animals euthanized by local veterinary clinics and is permitted to depose of them in the municipal landfill, on the assumption that carcasses will be immediately and completely buried. However, it is suspected that the three eagles ingested barbiturate after scavenging on the exposed carcass of a euthanized animal. This serves to point out that the deposition of carcasses in landfills creates a risk of substantive wildlife poisoning by barbiturates, as large numbers of various wildlife species are regularly observed at landfills. For example, each winter, hundreds of Bald Eagles can be observed at the Campbell River Landfill.

The Canadian Wildlife Service and the British Columbia Ministry of the Environment are investigating the incident and the policies which permit the disposal of euthanized animals in landfills. It currently is not clear if this procedure is legal or sanctioned. In most jurisdictions in British Columbia, incineration of euthanized carcasses is the norm. Our goal is to reduce the potential for the occurrence of these types of incidents in the future. (Laurie Wilson and John Elliott, Canadian Wildlife Service, Delta, BC; Dr. Malcolm McAdie, Consulting Veterinarian - Centre for Coastal Health; Ministry of Environment, Lands and Parks).

Diseases in endangered marmots

The Vancouver Island marmot (Marmota vancouverensis - V.I.M.) is one of the rarest mammals in the world. There are only approximately 150 individuals remaining, all on Vancouver Island, British Columbia. Significant effort and resources have been directed towards research, development and implementation of a recovery plan for this species.

During 1997, a bacterial infection (Yersiniosis: infection with Yersinia frederiksenii) was responsible for the death of four marmots that were experimentally transplanted to a previously occupied site in the fall of l996. The marmots entered their hibernaculum in the fall of l996 but did not emerge in the spring. Project biologists excavated the extensive burrow system and found three of the carcasses by following signals from implanted abdominal transmitters. The remaining carcass could not be reached. The carcasses were frozen and necropsies were performed subsequently.

Although decomposition was severe, internal organs were examined. Body fat appeared adequate. Gross abnormalities were confined to the lungs and heart. The hearts appeared globose with engorged vessels or hemorrhage of the epicardium. The lungs were mottled with a lobular pattern of atelectasis.

Tissues were submitted to the Animal Health Centre at Abbotsford for routine histology, bacteriology and virology. A heavy growth of Yersinia frederiksenii was cultured from lung, liver and kidney in all animals. Histology demonstrated bacterial colonies and inflammatory reactions in tissues examined.

Yersinia frederiksenii is considered to be an opportunistic pathogen with low virulence and is related to Y. enterocolitica. It is occasionally cultured from healthy and sick humans, soil and water sources. It has been cultured from hibernation-stressed ground squirrels in Alaska (personal communication, John Blake), but has not been cultured from a wild animal source in Canada to our knowledge.

At a second colony, hair loss due to a skin parasite (a mite of the genus Chorioptes) was observed in animals captured and handled in the summer of l997 . The mite was recovered by skin scraping but has not yet been identified to species.. Animals with poor haircoats from this colony have now grown normal coats without treatment.

While the finding of these diseases may be unique, isolated incidents, these or other diseases may be associated with failure of individual marmots to thrive or with lack of colony success. At this time, there is insufficient evidence to make conclusions regarding the impacts of disease on V.I.M. populations and implications for the Recovery Plan for this species. Given the precarious status of the species, it is essential to determine if diseases acting independently or additively can reduce the viability of colonies, thus reducing the effectiveness of management and recovery efforts.

Further management of V.I.M. will require a more complete understanding of the effects and implications of these health issues. An in-depth investigation of VIM health is planned to begin in l998. (Helen Schwantje, Wildlife Veterinarian, Ministry of Environment, Lands and Parks; Craig Stephen, Director, Centre for Coastal Health; Malcolm McAdie, Consulting Veterinarian, Centre for Coastal Health, Ministry of Environment, Lands and Parks).

Outbreak of viral disease in tiger salamanders

A die-off of tiger salamanders (Ambystoma tigrinum) was detected by a biology graduate student in ponds near Regina, Saskatchewan, during May and June, 1997. Introduction of tiger salamanders from the wild into a captive population also resulted in high mortality in the captive group. Animals became lethargic, stopped eating, developed pale foci and ulcers in their skin, and often developed bloody diarrhea prior to death. Necropsy findings consisted of liver, intestinal and skin necrosis. Viral inclusions were identified using light microscopy and subsequent transmission electron microscopy identified the virus as being similar to iridoviruses. The virus has been isolated and further work is underway to characterise the virus and the disease it causes.

This is a new or newly recognized viral disease of tiger salamanders. Iridovirus-like organisms have been implicated recently in die-offs of frogs in Australia and Britain. Closely related iridoviruses also have been implicated in diseases of fish. In Australia, the

Bohle iridovirus from frogs has been experimentally transmitted to fish, resulting in high mortality. This viral disease in tiger salmanders requires further study due to the potential implications to both amphibians and fish. (Trent Bollinger, CCWHC - Western/Northern Region).

Fish deaths caused by parasites

On 1 September, 1997, commercial fishermen found small dead fish floating in three bays on the southwest shore of Wollaston Lake, Saskatchewan. The seven fish submitted for examination were ciscoes (Coregonus artedii). The number of fish involved was unknown but was likely in the range of 100 to 200. The proximity of this area of the lake to mining operations caused concern about the possibility of the fish having been exposed to effluent or toxins from the mine site. At necropsy, six of the seven fish had several large tapeworm larvae (plerocercoids) in the chamber of the atrium of the heart. These parasites were of sufficient number and size to seriously impair blood flow through the heart and were thought to be the cause of mortality in these fish. Heart sections in the seventh fish were not adequate to determine if parasites were present.

Another fish kill was reported from Mud Lake, near Denare Beach, Saskatchewan in late August. No estimate of mortality was made, but 32 cyprinids (minnows) were submitted to the CCWHC for study. Environmental contaminants were again suggested as a possible cause of death in these fish. All fish were decomposed but in the two least decomposed fish several fluke larvae were found in the brain and meninges. The flukes may have been responsible for the die-off; however, because of the advanced putrefaction, other causes for the die-off can't be ruled out.

These cases highlight the importance of investigating fish kills to better understand natural mortality versus mortality caused by environmental contaminants. Collection of suitable samples for diagnosis and complete field information is critical in determining the cause of such die-offs. (Trent Bollinger, CCWHC- Western/Northern Region).

ANNOUNCEMENT

The CCWHC and the Wildlife Health Fund, Western College of Veterinary Medicine will present a short course entitled: MOVING WILD ANIMALS: (Health and environmental issues, assessing risks and benefits), at the Western College of Veterinary Medicine, Saskatoon, March 4-6, 1998.

Wild animals have been moved for many years to achieve objectives related to Conservation Biology (restocking historic range, taking endangered species into captive breeding programs); Wildlife Management (disposal of surplus animals, bolstering of small populations, creating new populations), Agriculture (game farming; aquaculture) and other purposes, such as for zoological collections. Animal translocation has resulted in many failures, and in "successes" that far exceeded expectations, resulting in new problems. The emphasis in this course will be on animal health, both of the animals being moved and of wild populations at the destination site. Subjects will include: Why move wildlife? (What are the potential benefits?, how are these assessed?, what are the alternatives?), Risks associated with translocation (What are they?, How can they be identified, measured and predicted?), and if translocation is done, what methods are available to reduce risk to a minimum.

For information regarding the course, call the CCWHC Headquarters Office at (306) 966-5099.

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